

ALCOHOL  
AND THE  
HUMAN BODY.



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ALCOHOL  
AND THE  
HUMAN BODY.

A LECTURE  
DELIVERED AT  
VINTNERS' HALL,  
BY  
THE WINE TRADE CLUB

On Monday, the 13th May, 1912.



# ALCOHOL

## AND THE

# HUMAN BODY.

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**I**T is one of Nature's own laws to render agreeable that which is useful and the natural liking for alcohol amongst all races and in all times is a proof in itself that alcohol is intended by Nature for the use and for the good of mankind.

As far back as we can go in the annals of the world's history, we find abundant and undeniable proofs of the constant use and abuse of alcohol. It would be strange, indeed, if the instinct of so many generations should have been at fault during all the past centuries of which we possess docu-

#### 4 ALCOHOL AND THE HUMAN BODY.

mentary evidence; and it would be stranger still if alcohol was otherwise than beneficial to both body and mind when, at the present moment, we are bound to acknowledge that all Great Powers are the least abstemious nations; futhermore, it may be rightly asserted that the consumption of alcoholic beverages is greater in those countries which are the most prosperous or the most highly civilised, whilst Buddhists and Moslems, who excelled in all arts and were races of rulers before they had become water-drinkers, are now either under the rule or at the mercy of alcohol-drinking races.

History and common sense supply us with a mass of evidence in favour of the beneficial effects of alcohol upon the human body, but it is highly interesting to know whether and in



what degree their verdict is endorsed by modern science; let us, therefore, put aside historical proofs and all circumstantial evidence, and let us examine the question from a purely scientific point of view.

The only scientific and rational manner of approaching the question is, first of all, to know what is meant by the word alcohol.

Alcohol is the name of a class of neutral compounds of carbon, hydrogen and oxygen, capable of forming ethers with acids. This class comprises a great many members, some of which, far from being volatile, are not even liquid. Cetyl alcohol, for instance, is a solid fat whilst cerylic and myricylic alcohols are waxy. Glycerine, which is a trihydric or triatomic alcohol ( $C_3H_8O_3$ ), fusel oil or amylic alcohol ( $C_5H_{12}O$ ),

## 6 ALCOHOL AND THE HUMAN BODY.

methyl alcohol ( $\text{CH}_4\text{O}$ ), propyl alcohol ( $\text{C}_3\text{H}_8\text{O}$ ), butylic alcohol ( $\text{C}_4\text{H}_{10}\text{O}$ ) and a great many more, all have an equal right to the name alcohol. But, by far the most important member of this large family is ethylic alcohol ( $\text{C}_2\text{H}_6\text{O}$ ), a compound of two molecules of carbon, six of hydrogen and one of oxygen. In other words, ethylic alcohol has the same chemical composition as water with one of its hydrogen atoms replaced by a hydro-carbon radical composed of two atoms of carbon and five of hydrogen.

Scientifically speaking, the term alcohol should always be qualified, but, when used alone, it is understood to refer to ethylic alcohol, the principal stimulating agent of all alcoholic beverages. The chemical composition of ethylic alcohol is beyond contro-

versy and it embodies all the organic elements of protoplasm, viz.: carbon, hydrogen and oxygen. There is absolutely nothing in the chemical composition of ethylic alcohol which would entitle it to be called a poison or a narcotic; it has none of the chemical characteristics of known poisons, and it does not possess any of their properties.

Alcohol is a nutrient and a nervine; that is to say, a food with a specific action upon the nervous system.

Alcohol, like carbo-hydrates, such as sugar, creates heat and furnishes energy for muscular work.

Alcohol has a specific action upon the nervous system; an action which leads to perfectly normal functional changes, and causes a certain inner mental stimulation.

## THE FOOD VALUE OF ALCOHOL.

The two functions of food are to furnish materials for the formation of the tissues of the body, and to yield energy for warmth and for muscular work. Nitrogenous foods or proteids, such as the casein of milk, the albumen of egg, the gluten of wheat, etc., are tissue-building foods, whilst fats, such as butter, and carbo-hydrates, such as sugar or starch, supply the energy or fuel required; they are burned, or oxidised, and transformed into heat and muscular strength. Alcohol contains no nitrogen and, therefore, cannot build tissue, any more than sugar or starch can, but it is a food in the same sense as these, supplying heat and energy by oxidation in the body.

That alcohol is almost entirely



oxidised in the body, except when taken in very large quantities, has been proved by the most exhaustive scientific experiments. "The outcome of the best investigation on this subject may be summarised," writes Professor W. O. Atwater, "as follows:—The alcohol of ordinary beverages is easily absorbed from the stomach and the intestines into the circulation, and readily burned. If the amount taken is small, the oxidation is almost complete. When the quantity taken is excessive, the amount unconsumed is likely to be much larger. As the experiments with alcohol have been more accurate, the proportion actually oxidised has appeared larger and larger. When taken in small quantities—say, one or two glasses of wine or a glass of whisky at a time—the alcohol has been found

to be burned at least as completely as bread or meat. The reason for discussing at such a length a theory discarded a quarter of a century ago by the leading authorities is that it has remained current in the writings of some authors, and even in some of our school physiologies which deny the food value of alcohol."

The oxidation of alcohol in the body is a fact placed by science beyond all doubt, but it is far more difficult to ascertain the amount of heat and energy produced by the oxidation of alcohol, and, therefore, the actual food value of alcohol.

To compare the degree of nourishing power of different foods, we must remember that the caloric or heat power of different substances differs, that is to say that the heat and

energy which will be produced by the oxidation of one ounce of sugar, for instance, will differ from the heat and energy which the oxidation of one ounce of butter will produce. Very exhaustive experiments were carried out by Professor Atwater and the *Committee of Fifty for the investigation of the liquor problem* which was appointed by the United States Government some few years ago, for the purpose of ascertaining the food value of alcohol. Pure ethylic alcohol, diluted in water or coffee, was used for these experiments, and it is claimed that when the quantity of fat, sugar and starch was reduced by what would produce 500 caloric units and replaced by a sufficient quantity of alcohol to furnish 500 caloric units, the work done and the energy given off from the body

were practically the same. This proved that alcohol not only was oxidised in the body but also to the same good purpose as a similar heat giving quantity of fat, sugar and starch; in other words, alcohol supplied the same energy to the body as fats and carbo-hydrates. Furthermore, it was proved in the most absolute manner that, when carbo-hydrates were replaced by alcohol, in the diet of the subject experimented upon, there was no need to increase the proportion of albumin included in the diet; alcohol acted in exactly the same way as carbo-hydrates in saving the albumin stored in the body, an absolute proof of its being a nutrient.

Further evidence of the food value of alcohol has been provided by many scientific experiments made to test the influence of alcohol on muscular effort



and fatigue. The favourite method employed for these experiments is the use of the ergograph.

The ergograph is an instrument designed to register the variations of muscular effort; it is derived from two Greek words, *ergon* which means work, and *graphein*, to write. Either the middle finger or the last joint of that finger is fitted with a ring of leather to which is attached by a string a weight of about nine pounds hanging over a pulley; the forearm and hand being at rest, this one finger is bent at fixed intervals in rapid succession, the weight being lifted as high as possible until exhaustion occurs. By an ingenious contrivance, a needle is fixed to the apparatus which traces a curve indicating the rapidity of the contrac-

tions and the height to which the weight is lifted each time.

The first worker to use the ergograph for the investigation of the action of alcohol was W. P. Lombard in 1892; taking small doses of alcohol, in the form of Claret, he found an increase in the amount of work, the effect showing itself in a few minutes, and lasting in one case for an hour-and-a-half. Two years later, Rossi tested the action of alcohol, in the form of rum, on the work executed in fifteen ergograms, taken at intervals of ten minutes. With doses of eighty grammes, corresponding probably to about thirty grammes of absolute alcohol, he found an increase in the total amount of work, but this increase was chiefly due to the earlier ergograms, the latter showing a

decrease as compared with the work of days on which no alcohol had been taken. With smaller doses of twenty-five grammes of rum, the favourable influence was more pronounced, and persisted for the whole of the two hours during which the experiment lasted.

Frey, whose work was published in 1896, found that the action of alcohol on the fatigued muscle was different from that on the unfatigued muscle. When alcohol was given ten minutes before beginning to work with the ergograph, the effect in most persons was to diminish the amount of work. If, on the other hand, the alcohol was given after a certain number of ergograms had been recorded, so that some fatigue had been induced, Frey found that alcohol

had a beneficial effect, and that the increase in the amount of work might be considerable. From these observations, he concluded that alcohol has a double action—an injurious action on the nervous system, which predominates when the muscle is unfatigued, and a beneficial action as a food for the muscle substance.

In 1897, was published a paper by Tavernari, who found that 50 grammes of Marsala Wine, taken after a walk of 30 kilometres, doubled the amount of work executed with the ergograph.

In 1899, the observations recorded by Kraepelin and based chiefly on Gluck's work, were published. Two series of observations, each of eight days, were made, the first with pauses of 10 minutes, and the second with pauses of 3 minutes between the ergograms. The



alcohol was given not in wine, beer or spirits, but in the form of ethylic alcohol in doses of 40 grammes, a very hard test indeed as regards both the nature and the amount of alcohol taken. In the first series, with pauses of ten minutes, there was a marked initial increase, which disappeared to a large extent in the second ergogram, but the work remained above the average during the whole duration of the experiment until the last curve, which showed a slight sinking below the level of the days on which no alcohol had been taken; the whole work, however, showed an increase of 13 per cent. above that of the "non-alcohol days." In the second series, with pauses of only three minutes, the effect was different; there was a large initial increase of 30 per cent., which dis-

appeared in the second ergogram, from which point there was a diminution in the amount of work, so that at the end the total work was only half that of the "non-alcohol days."

In the same year, Schumburg published some observations on the effect of alcohol, in which he claims that, in uncomplicated ergographic work, alcohol had a beneficial influence, but that in the presence of general fatigue produced by work with the ergostat, it had no influence.

In 1900 appeared the work of Scheffer, who experimented upon himself and used Mosso's ergograph. Ten grammes of absolute alcohol were taken immediately in one series, and fifteen minutes before the beginning of the work in another, and in each case the amount of work was increased. In a third

series in which the same dose was taken thirty minutes before beginning to work, the effect was unfavourable, a smaller amount of work being done with alcohol throughout.

In 1901, an account of the work done by Oseretzkowsky and Kraepelin was published; ergograms were taken at two minutes' intervals, and, after the seventh, a dose of alcohol was taken, and the work was continued for an hour. The alcohol was only taken on four days, fifteen grammes being taken twice, and thirty and fifty grammes on the other two days. On one day the dose of fifteen grammes produced an increase, which continued to the end of the experiment; on the other day, there was a slight falling off as compared with the average of three days on which no alcohol was taken. The doses of thirty and fifty

grammes produced very little effect. In the same Paper, there are also recorded experiments by Moskiewicz with a dose of thirty grammes taken on three days, which showed a slight increase on the alcohol days.

In 1903, Schnyder published an interesting Paper, in which he gives evidence that the effect of alcohol may be different according as it is taken soon after a meal or at a considerable interval. His first observations were made four hours after a meal, six to twelve ergograms being recorded at minute intervals. The alcohol was taken in the form of Claret and in such an amount that the dose of absolute alcohol would be about fifteen grammes. In one series, the alcohol was taken fifteen minutes before beginning to work by two subjects,



and in both cases there was an increase in the total amount of work, equal to ten per cent. in one case, and to five per cent. in the other. In the second set of experiments, Schnyder tried the effect of thirty grammes doses of alcohol taken during a meal and found that, in both subjects, there was a slight decrease in the total amount of work.

In 1904, the "Travaux du Laboratoire de Physiologie" published Mdlle. Joteyko's interesting work on alcohol. She generally used small doses of alcohol (twenty grammes), and found very great individual differences among the seven persons who were experimented upon. Three were almost entirely resistant to the action of alcohol, even when the dose was increased to fifty grammes, though two then showed a slight diminution

in the amount of work. Two other persons showed a decided increase in the amount of work after doses of twenty to thirty grammes of alcohol. The remaining two subjects showed a decided diminution—in one case even with ten grammes of alcohol—and this action was so pronounced in one case that the weight could hardly be lifted at all after twenty grammes of alcohol had been taken.

In 1908, Rivers experimented upon himself and a friend, Mr. Webber, a life-long abstainer and temperance worker. The most interesting part of Rivers' experiments is that he states that when comparatively small doses of ethylic alcohol were taken, the work suffered, whilst after forty c.c. of whisky, in Webber's case, and two glasses of champagne in his own case,

there was a very marked increase in the amount of ergographic work they were able to do.

The fact that alcohol is a food and is oxidised in the body like carbohydrates, such as sugar or starch, is only too often overlooked, and alcohol then becomes a danger. Corpulence, gout, dilatation or relaxation of the heart, and similar diseases, are more frequent amongst drinkers than abstainers, but it is scientifically wrong to blame alcohol for any such complaints; they are solely due to over-nutrition, not to alcohol as such. People who eat as much proteids, fats and carbo-hydrates as they require, and even more than they require, and at the same time do not deny themselves the pleasure and comfort of alcoholic beverages, should realise that

by so doing they are taking more food in the shape of alcohol, and an excess of food which must perforcedly be injurious to the body. Alcoholic beverages should be taken in place of, and not in addition to, a certain amount of fats and carbo-hydrates; if the body is supplied with all the fats and carbo-hydrates required to produce the necessary heat and energy, alcohol will only cause fat deposits in organs in which fat cannot be used.

It might be said that, since alcohol takes the place of carbo-hydrates, carbo-hydrates could also take the place of alcohol, so that by increasing the proportion of fats or carbo-hydrates in one's diet, one might easily dispense with alcohol.

If alcohol were nothing but a food, this assumption would be quite correct,

but it is absolutely incorrect because alcohol is not only a food, but a food with a very marked specific action upon the nervous system. As a nutrient alcohol can be replaced by carbo-hydrates, but as a nervine it has no substitute. Most people drink alcoholic beverages for the specific action they exercise upon the nervous system and the brain, but many fail to realise that alcohol also possesses a very real food value which is beneficial in itself but becomes a serious danger, as in the case of all foods, when taken in excess.

### THE SPECIFIC ACTION OF ALCOHOL UPON THE NERVOUS SYSTEM AND THE BRAIN.

Our nervous system is the most complicated part of our organism. It



## ALCOHOL AND THE HUMAN BODY.

comprises a central nervous system, including the brain and spinal cord, and, leading from these, a network of nerves controlling all the organs and glands of the body.

We know that alcohol excites in a specific manner the sensory nerves of smell and taste, since we can easily detect its presence whenever we are either smelling or tasting it. We also know that alcohol has a marked action upon the secreting nerves of glands, which it causes to contract and discharge their cell contents, saliva in the mouth or gastric juices in the stomach. This is the result of perfectly normal functional changes which have nothing in common with disturbances. As soon as alcohol comes into contact with the mucuous membrane of the stomach, a more abundant but perfectly normal

secretion of gastric juices takes place as a result of the excitation or contraction of the nervous end-apparatuses of the stomach.

To ascertain experimentally the action of alcohol upon the nervous system, and particularly so upon the brain or central nervous system, is as yet beyond the reach of science.

Professor Kraepelin and his pupils of the Heidelberg School have, it is true, investigated the action of alcohol on the mental processes. The methods they employed consisted chiefly in ascertaining the speed and character of various mental exercises, and then observing how far they are modified by the administration to the subject under examination of various doses of alcohol. The experiments were devised principally to estimate the acuteness of

perception as shown, for instance, by the recognition of letters, syllables or figures presented to the sight for very brief periods; and to demonstrate the rapidity and accuracy displayed in such exercises as reading aloud, adding rows of figures, committing figures to memory, etc.

The inherent vice of all such experiments is that they are carried out under conditions which greatly differ from those of ordinary life. The subjects who are asked to produce certain mental efforts before, during or after being given to drink various doses of alcohol, are bound to be influenced to a large extent by the mere knowledge of what is expected of them. Besides, it is universally recognised that alcohol, like shellfish, milk, fruit and all aliments, will affect different men

differently, and also that any one man may be affected differently by the same quantity of alcohol, taken in the shape of either wine, beer or spirits. It is quite easy to understand that a German compositor, for instance, who usually drinks German beer, is not likely to set up type at a quicker rate when treated by the experimenting professor to some "Greek Wine" or to some German brandy distilled from potatoes and diluted in coffee; the quantity of ethylic alcohol may be the same but everything else is so different that whatever phenomenon may be observed as a result of the change of diet cannot scientifically be attributed to alcohol.

This is why Dr. W. C. Sullivan, Medical Officer in His Majesty's Prison Service, and one of the most conscientious temperance advocates of

the present day, when dealing with the experimental methods applied to the study of the influence of alcohol upon the nervous system, wrote: "Of course, it will readily be understood that the conclusions to which this sort of evidence can lead are for the most part merely probable. The questions at issue are of such complexity that it is very difficult to devise experiments for their solution that will not be open to many and grave fallacies; the effects of slight differences in technique or of peculiarities in individual reaction are likely to show on an exaggerated scale, and hence to produce discordant results; and even when the results are agreed on, their interpretation will still depend upon physiological principles regarding which the sharpest



and most radical differences of opinion prevail."

Although it is not possible to gauge experimentally the action of alcohol upon the nervous system with any degree of scientific accuracy, it has been abundantly proved by medical experiments and every day experience that alcohol has a marked specific action upon the creative faculties of the brain.

The human brain possesses both active and passive properties; imagination, for instance, is one of the active or creative faculties, whilst memory is simply passive or receptive. The passive and active faculties of the brain are quite distinct. Many animals possess a receptive brain; their sense of locality, their memory and their instinct guide them, but they are

incapable of original thought, imaginative power, or high ideals. On the other hand, men of real genius, who have attained to great celebrity in the world of letters, arts, or politics, have been known to lack memory and the instinct of self-preservation, which even the lower class animals possess.

Alcohol has the very remarkable property of deadening to a certain extent the passive or receptive faculties of the brain whilst exciting at the same time, or stimulating its active or creative powers and the inner self or personal psychic ego of man.

Alcohol cannot supply brain power where there is none nor make a selfish man unselfish or a fool clever. It will, however, bring into play, stimulate into action, and inten-

sify the temperament and the qualities, good, bad or indifferent, it may be one's good or bad fortune to possess.

Alcohol will help the poet, the artist, the orator, to forget the petty cares and troubles which may harass him ; it will deaden the sense of self-consciousness and diffidence which drove him to sterile inaction, and, at the same time, it will stimulate his genius to greater activity. But alcohol will only cause the sanguine and brainless man to be jolly, the bilious fool to be irritable and the phlegmatic dullard to be peacefully happy ; it can never create sense where there is none.

In other words alcohol urges the gifted to remember and use their gifts and hides from the giftless the injustice of fate.

## THE USE AND ABUSE OF ALCOHOL.

Ethylic alcohol is a food with a specific action upon the nervous system, and this fact not only justifies the use of alcoholic beverages but it also explains scientifically why they have been used in all ages and amongst all civilised nations.

Excellent as the moderate use of alcohol is, its abuse cannot be too strongly deprecated. In all questions of diet, moderation is a golden rule which can never be broken without grave danger. All aliments become a source of danger—and will even become poison—above a certain dose. Daily excessive ingestion of any fluid must burden the heart, the blood vessels and the kidneys; whether the liquid ingested be water, milk or beer,

the difference will be one of degree, not of kind; excessive drinking of water is bad, but excessive drinking of milk or beer is worse, because of their food value. What is known as the beer-heart, for instance, is not the result of the action of alcohol, but of over-nutrition; it is the abnormal quantities of liquid, and not the small percentage of alcohol contained therein, which have overtaxed the functions of the heart and caused the fatty degeneration of that organ.

It must be remembered that although they all contain a certain proportion of ethylic alcohol, all alcoholic beverages vary considerably on account of the different elements they are composed of, far more than on account of the more or less important quantity of ethylic alcohol they may contain.



There might be, for instance, exactly the same quantity of ethylic alcohol in a pint of light Moselle as in a glass of beer; in a pint of Claret as in a glass of Port; in two glasses of Champagne as in one glass of whisky and soda; in a glass of brandy as in a glass of gin; but, in each case, different physiological results are likely to be obtained. Just as one man cannot eat beef but enjoys mutton, as another who cannot digest cabbage will eat celery with impunity, or as another for whom strawberries are a poison yet may eat pineapple, so there are people whom beer suits better than wine or *vice versâ*; brandy may suit one man better than whisky, whilst the reverse happens to be the case with another. It is true that the chemical nature of the ethylic

alcohol is identical in both wine and beer, but the many other elements of which beer and wine are composed are altogether different, and they cannot be equally suitable in all cases.

Ethylic alcohol is of considerable value to the economy of our organism, but it should never be abused nor taken in the shape of one or the other alcoholic beverages which may not be suitable to individual temperaments or in particular cases. He who suffers from diabetes, for instance, must not blame alcohol if he finds that the sweet wine he drinks disagrees with him; let him take the same moderate quantity of alcohol in the shape of dry and somewhat acid wines and he will find that they suit him admirably. Just as sugar is to be avoided in cases of diabetes or asparagus

in kidney diseases, so should alcohol be avoided in all complaints when inflammation or fever occurs. But, with that exception, the number and variety of alcoholic beverages are so great, that in health and sickness, in youth and old age, bountiful Nature has provided for us a marvellously ordained range of wholesome stimulants to suit all different temperaments, tastes and circumstances.

Like most of God's best gifts, alcohol always has been and still is abused. The sin of drunkenness has been justly denounced in Holy Writ, as well as by all the philosophers of ancient Greece and Rome and by all moralists ever since. It was not, however, until the last century that some men in this country revived Mahommed's heresy

and preached the doctrine of total abstinence.

Amongst those who to-day share the new faith, there are men who have attained to such eminence in the medical profession, that we are bound to ask ourselves how and why it is that such great intellects should have adopted views in utter contradiction with the universal experience of mankind and experimental science.

It certainly seems strange that one of the ablest of our London Specialists should affix his name to a book purporting to prove scientifically that alcohol is a poison, at all times injurious to body and mind alike, and to find that the scientific proofs of this statement are based on experiments made with jelly-fish, water-fleas, water-cress, etc., showing that the lowest

forms of animal and plant life are injuriously affected by the action of alcohol, just as if jelly-fish would not equally resent being placed in milk, however rich in cream, or even in distilled water. Another suggested experiment in the same book is to drop some brandy into the naked eye and realise the disturbance caused by the "poison." Further, the few unfavourable reports of investigators with the ergograph are also given, but all the favourable results obtained by the same and other investigators are carefully omitted.

It would be unjust to those doctors who advocate total abstinence to believe them capable of looking on such proofs as scientific. It is not science, it is not common sense, it is not truth on which stands their faith in



water ; it is their charity, their pity for the poor deserted children of the drunkard, the hapless young wife of the dipsomaniac. They see the evils—evils which are real and great—which are due to the *abuse* of alcohol, and they are so moved by the bodily and mental misery which they have personally known to be caused by such abuse, that they lose sight of the fact that the benefits accruing from the proper use of alcohol are far greater than the evils due to its abuse ; they forget what they often owe themselves to the moderate use of stimulants, and what the world, what their own country owes to alcohol. They forget that from Chaucer, the son of a royal butler, to Ruskin, the son and grandson of wine merchants, every poet, dramatist, artist and writer of genius, every great thinker has been

a wine drinker ; that every ruler, every prime minister, every brain-worker, who has ever merited his country's and perchance humanity's gratitude, all have used and some have abused that most noble gift of a divine Providence : Wine.

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EXTRACT FROM THE "LANCET."

MARCH 30TH, 1907.

In view of the statement frequently made as to present Medical opinion regarding alcohol and alcoholic beverages, we, the undersigned, think it desirable to issue the following short statement on the subject—a statement which, we believe, represents the opinions of the leading Clinical Teachers, as well as of the great majority of Medical practitioners.

Recognising that, in prescribing alcohol, the requirements of the individual must be the governing rule, we are convinced of the correctness of the opinion so long and generally held, that in disease alcohol is a rapid and trustworthy restorative. In many cases it may be truly described as life-preserving, owing to its power to sustain cardiac

and nervous energy, while protecting the wasting nitrogenous tissues.

As an article of diet we hold that the universal belief of civilised mankind that the moderate use of alcoholic beverages, is, for adults, usually beneficial, is amply justified.

We deplore the evils arising from the abuse of alcoholic beverages. But it is obvious that there is nothing, however beneficial, which does not by excess become injurious.

T. McCALL ANDERSON, M.D., Regius Professor of  
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